

REMARKS

This application has been carefully reviewed in light of the Office Action dated January 15, 2009. Claims 12 to 15 remain in this application. Claim 12 is the independent Claim. Claim 12 has been amended. Claims 1-11 and 16-21 have been cancelled, without prejudice. It is believed that no new matter is involved in the amendments or arguments presented herein

Reconsideration and entrance of the amendment in the application are respectfully requested.

Non Art-Based Rejections

Claims 12-15 were rejected under 35 U.S.C. § 112, first paragraph for lack of enablement. In response, Applicant has amended the claim to make clear that the claimed resin film includes a thermoplastic polyimide resin.

Applicant notes that Paragraphs [0144] et seq. of the publication of the present application (U.S. Patent Application Publication No. 2006/0115670) discuss a preferred embodiment of the present invention. In particular, [0147] discloses “surface treatment for forming irregularity on the surface of the thermoplastic polyimide resin,” and “surface treatment for partially removing the surface layer of the thermoplastic polyimide resin.”

Moreover, [0036] of the present Patent Application Publication indicates that a surface treatment for the particular “thermoplastic polyimide resin” provides a resin film with “sufficiently higher adhesive strength than that expected as an anchor effect regardless of its low surface roughness....” Clearly, one of ordinary skill in the art would realize that a key point of the present invention concerns a

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combination of thermoplastic polyimide resin and surface treatment rather than being limited to an aromatic polyimide.

Furthermore, the present Specification clearly discloses sufficient information to allow one of ordinary skill to prepare the thermoplastic polyimide resin, thus rendering the instant Specification fully enabling under the requirements of § 112, first paragraph.

Reconsideration and withdrawal of the above § 112 rejection are therefore respectfully requested.

Art-Based Rejections

Claims 12-14 were rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 4,806,422 (Ohno); Claim 15 was rejected under § 103(a) over Ohno in view of U.S. Patent No. 6,461,722 (Kitel); Claims 12-15 were rejected under 103(a) over U.S. Patent Application Publication No. 2001/0013425 (Rokugawa); Claims 12, 14-15 were rejected under § 103(a) over U.S. Patent Application Publication No. 2002/0054991 (Shibuya).

Applicant respectfully traverses the rejections and submits that the claims herein are patentable in light of the clarifying amendments above and the arguments below.

The Ohno Reference

The applied Ohno reference is directed to a thermal transfer printing film. (*See, Ohno, Abstract*). Ohno teaches a surface that is as flat as possible to allow for optimal head conduction. (*See, id., Col. 3, Lines 10-18*).

The Kitel Reference

The applied Kitel reference is directed to a thermal transfer laminate for providing pictorial and/or print designs. (*See, Kitel, Abstract; Col. 1, Lines 6-9*).

The Rokugawa Reference

The applied Rokugawa reference is directed to a substrate of multilayered structure having a plurality of sets of an insulation layer and a wiring line layer for a semiconductor device. (*See, Rokugawa, Abstract; [0001]*).

The Shibuya Reference

The applied Shibuya reference is directed to a thermoplastic resin film having on a surface thereof a hydroxy-modified imine polymer. (*See, Shibuya, Abstract; [0001]*).

The Claims are Patentable Over the Cited References

The present application is generally directed to a thermoplastic resin film.

As defined by amended independent Claim 12, a resin film includes a thermoplastic polyimide resin having a surface shape formed on at least one of the surfaces thereof. The surface shape has a Ra1 value of arithmetic mean roughness of 0.05 μm to 1 μm measured with a cutoff value of 0.002 mm, and a Ra1/Ra2 ratio of 0.4 to 1 and a Ra2 value measured with a cutoff value of 0.1 mm

The applied references do not disclose or suggest the above features of the present invention as defined by amended independent Claim 12. In particular, the applied references do not disclose, teach or suggest, "a resin film comprising a thermoplastic polyimide resin having a surface shape formed on at least one of the surfaces thereof, the surface shape having a Ra1 value of arithmetic mean

roughness of 0.05 μm to 1 μm measured with a cutoff value of 0.002 mm, and a Ra1/Ra2 ratio of 0.4 to 1, Ra2 being a value measured with a cutoff value of 0.1 mm," as required by amended independent Claim 12 of the present invention.

Applicant respectfully points out that in discussing the present invention and comparing the claims herein to the applied references, the Office Action does not properly focus on the nature and features of the present invention that are important to the success of the invention and which also distinguish the claims of the present invention from the applied references.

By way of explanation, [0143] of the present Patent Application Publication defines its use of arithmetic mean roughness Ra and cut off value:

The arithmetic mean roughness Ra is defined in JIS B0601 (revised on Feb. 1, 1994). In the present invention, particularly, the value of the arithmetic mean roughness Ra is determined by observing the surface with an optical interference-type surface structure analyzer. In the present invention, the term "cutoff value" represents the wavelength determined for obtaining a roughness curve from a sectional curve (observed data) according to JIS B0601. Namely, the Ra value measured with a cutoff value of 0.002 mm means an arithmetic mean roughness calculated from a roughness curve, which is obtained by removing irregularity with wavelengths of 0.002 mm or more from the observed data. Therefore, when there is no irregularity with wavelengths of 0.002 mm or less, the Ra value measured with the cutoff value of 0.002 mm is 0 μm .

[0148] of the present Patent Application Publication emphasizes the importance of Ra1, Ra2 and their corresponding cut-off values to the present invention:

In any one of the methods, it is important that the arithmetic mean roughness Ra1 value measured with a cutoff value of 0.002 mm is 0.05 μm to 1 μm , and the Ra1/Ra2 ratio to the Ra2 value measured with a cutoff value of 0.1 mm is controlled to 0.4 to 1. The Ra1 value is preferably 0.1 μm to 0.8 μm and more preferably 0.2 μm to 0.6 μm , and the Ra1/Ra2 ratio is 0.5 to 1 and more preferably 0.6 to 1. The Ra2 value indicates irregularity with wavelengths of 100 μm or less. Since the irregularity with wavelengths of over 100 μm possibly includes, at a high ratio, wrinkles and curls occurring in a film at the time of setting of a sample for observing the surface shape, the Ra2 value is set as a value suitable for removing irregularity which is not original irregularity of the film. On the other hand, the Ra1 value indicates irregularity with wavelengths 2 μm or less.

[0149] makes clear that:

[W]ith a Ra1/Ra2 ratio of less than 0.4, the film has a large amount of irregularity with wavelengths of 2 μm to 100 μm and thus has difficulty in forming a microcircuit. Also, with a Ra1/Ra2 ratio of less than 1 but close to 1, a film surface has a large amount of micro-irregularity with wavelengths of 2 μm or less and is thus suitable for forming micro-wiring. Furthermore, with a Ra1 value of less than 0.05 μm , the formed irregularity does not have a sufficient height and thus has lower adhesiveness, while with Ra1 value of over 1 μm , the formed

irregularity has an excessively large height and thus has difficulty in forming a microcircuit.

One of ordinary skill in the art would appreciate from reading the present Specification that Ra1 and Ra1/Ra2 as well as their corresponding cut-off values are important aspects of the present invention.

[0036] of the present Patent Application Publication makes this clear. That paragraph discusses an embodiment of the present invention, according to which “a material containing a thermoplastic polyimide resin is subjected to specified surface treatment to improve adhesive strength and exhibit sufficiently higher adhesive strength than that expected as an anchor effect regardless of its low surface roughness, as compared with conventional materials such as epoxy resin and the like.”

Referring to the present Patent Application Publication, Comparative Examples 1 to 3 detailed in [0220], [0221] and Comparative Examples 6 and 7, discussed in [0271] and [0272] relate to a film comprising thermoplastic polyimide resin. One of ordinary skill in the art, analyzing these examples, would appreciate the significance of the claimed parameters.

Moreover, Comparative Example 5 on table 4, relating to epoxy resin has the surface shape, 0.06 of Ra1 and 0.38 Ra1/Ra2. As explained in [0149], with a Ra1/Ra2 ratio of less than 0.4, the film has a large amount of irregularity with wavelength of 2 m to 100m. Despite the film in Comparative Example 5 having a larger amount of rough irregularity than other Examples, the film of the conventional epoxy resin fails to provide sufficient adhesiveness, especially after PCT test. One of ordinary skill in the art would thus appreciate the higher

adhesive strength in the present invention than that expected as an anchor effect compared to the prior art techniques.

The present Specification would thus convey to one of ordinary skill in the art that, as a result of their studies, the inventors of the present invention found an inventive resin film including a thermoplastic polyimide resin having a surface shape formed on at least one of the surfaces thereof, the surface shape having a Ra1 value of arithmetic mean roughness of 0.05 μm to 1 μm measured with a cutoff value of 0.002 mm, and a Ra1/Ra2 ratio of 0.4 to 1, Ra2 being a value measured with a cutoff value of 0.1 mm, that exhibits unexpected adhesive strength compared to the conventional materials such as epoxy resin.

As detailed below, none of the applied references, alone or in combination, disclose the combined features of the present invention, as defined by amended independent Claim 12.

The applied Ohno reference concerns obtaining optimal heat transfer by making the surface as flat as possible. According to Ohno,

It is preferable that the stick-preventing layer surface of the film provided with such stick-preventing layer (hereinafter referred to as stick-preventing layer-formed film) is as flat as possible (that is, as small in roughness as possible) since greater flatness allows better heat conduction from the thermal head to the heat-melting ink layer.

(See, Ohno, Col. 3, lines 8 to 18.)

Accordingly, the focus of Ohno is to achieve as flat a surface as possible in order to allow for greater heat conductivity and one of ordinary skill in the art would not look to the teachings of Ohno for use with a printed circuit board.

In contrast, as detailed above, the present invention focuses on the roughness parameters designed to achieve optimal adhesive properties for use with printed circuit boards.

Moreover, one of ordinary skill in the art would appreciate that given the different focuses of the claimed invention and the Ohno reference; one would not look to the teachings of Ohno to achieve the features of the present invention.

Accordingly, Ohno does not disclose, teach or even suggest, “a resin film comprising a thermoplastic polyimide resin having a surface shape formed on at least one of the surfaces thereof, the surface shape having a Ra1 value of arithmetic mean roughness of 0.05 μm to 1 μm measured with a cutoff value of 0.002 mm, and a Ra1/Ra2 ratio of 0.4 to 1, Ra2 being a value measured with a cutoff value of 0.1 mm,” as required by amended independent Claim 12 of the present invention.

Concerning the applied Rokugawa and Shibuya references, the Office Action points to overlapping Ra1 values disclosed in these references compared to that of the present invention. However, the Office Action concedes that those references do not disclose or teach the Ra1/Ra2 ratio or the cut-off values claimed in the present invention, that, as detailed above, result in the unexpected adhesive properties of the present invention. Rather, the Office Action takes the position that one of ordinary skill in the art would somehow arrive at such claimed features with “great expectation of success.” (*See, Office Action, page 9*).

However, as detailed above, the combination of the claimed features of the present invention is important to the demonstrated unexpected results of the claimed thermoplastic polyimide resin surface shape. According to MPEP § 2143.02 evidence of unexpected results can negate a conclusion of obviousness. In this case, as discussed above and detailed in the present Specification, such unexpected

results are more than sufficient to overcome the Office Actions conclusions of obviousness.

Accordingly, the applied Rokugawa and Shibuya, alone or in combination, do not disclose, teach or even suggest the above features of the claims of the present invention as defined by amended independent Claim 12.

The ancillary Kitel reference fails to remedy the above discussed deficiencies of Ohno, Rokugawa and Shibuya.

Since the applied references fail to disclose or suggest the above features as recited in amended independent Claim 12, those references cannot be said to anticipate nor render obvious the invention which is the subject matter of that claim.

Accordingly, amended independent Claim 12 is believed to be in condition for allowance and such allowance is respectfully requested.

The remaining claims depend directly from amended independent Claim 12 and recite additional features of the invention which are neither disclosed nor fairly suggested by the applied references and are therefore also believed to be in condition for allowance and such allowance is respectfully requested.

Conclusion

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los

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Angeles, California telephone number (213) 225-2604 to discuss the steps necessary for placing the application in condition for allowance.

If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 031366.

Respectfully submitted,
Chan Law Group LLP

Date: July 15, 2009

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